A·I·A FILE NO 23G

Technical Information for Architects

RESILIENT FLOORS

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Technical Information
for Architects

THE PRODUCERS' COUNCIL

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INDEX

Armstrong's Services to Architects . . 2
Clear Specifications for Resilient Floors 2
Performance of Resilient Flooring Over Radiant Heating 4
Selection of Adhesives for Resilient Flooring 6
Which Resilient Floor Over Concrete? 8
Preparing Old Subfloors for Resilient Flooring 10
Selecting the Right Type of Underlayment 12
Maintenance Problems Must Be Considered 14
Armstrong Offices . . . . back cover

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Armstrong Cork Company, Lancaster, Pa.

ARMSTRONG'S SERVICES TO ARCHITECTS

Armstrong Cork Company makes all types of resilient floors for all types of interiors. Almost any flooring requirement can be met with one or more of the floors in the Armstrong Line. As a result, we can offer unbiased recommendations on any flooring problem. Our main interest is, of course, to aid you in making a sound flooring selection. For complete information, or recommendations on specific job requirements, contact the nearest Armstrong District Office listed on the back of this folder or write to Armstrong Cork Company, Lancaster, Pa.

Armstrong's Sales Representatives, an organization of over 125 men located throughout the country, represent an exceptional fund of experience and training in resilient flooring. They will gladly consult with architects on any flooring problem and make specific recommendations for individual jobs.

Complete Specifications on the installation of any Armstrong Floors are available upon request. For abridged specifications, see Sweets Architectural File.

Armstrong's Bureau of Interior Decoration, staffed with experienced interior designers, will, without obligation, suggest designs for floors, walls, and ceilings with complete room color schemes if desired.

clear specifications for resilient floors

The complexities of resilient flooring installation, labor, and material costs are generally of no great concern to the architect. However, it is important that he be able to classify the materials and work to be done so that all bidding contractors will base their estimates on the same standards. In many instances, the misunderstandings that occasionally arise between the architect and the flooring contractor stem from the specification writer's incomplete knowledge and understanding of the details which affect the contractors' labor and material costs. Because of the wide scope of the specification writer's work, it is impractical for him to become familiar with all such details. However, if he has a working knowledge of variations in cost of resilient flooring materials, labor, and subfloor preparation, he should have little trouble in writing clear and concise resilient flooring specifications.

Price Variations in Flooring Materials

Among the factors which govern resilient flooring material prices are:

Type and Style of the Resilient Flooring
Gauge or Thickness of the Material
Color and Graining
Standard or Special Sizes

Resilient flooring materials are manufactured in several types and gauges to meet various service requirements. In many cases, each type is made in a number of stylings to permit greater design freedom.

One of the items most often omitted from resilient flooring specifications is the naming of the particular flooring style and color group. This part of the specification is a very important factor in figuring costs. For example, Armstrong's Linoleum falls into three separate price groupings according to style and color. Plain Linoleum in regular colors, Jaspé, Raybelle, Marbelle, and Royelle are all in one price range while Embossed Inlaid, Spatter, Straight Line Inlaid, and Craftline Inlaid are priced slightly higher. Plain Linoleum in special colors is in the highest linoleum price grouping.

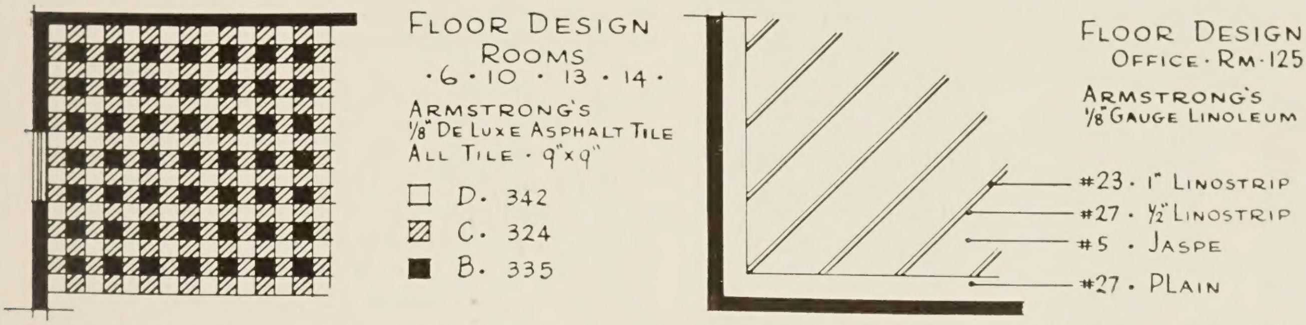
from specifications

Section No.10 Resilient Flooring

Furnish and install $\frac{1}{8}$" Armstrong's De Luxe Asphalt Tile and heavy gauge Armstrong's Linoleum in the colors, patterns, sizes and designs shown on the drawings and in the areas listed in the schedule of finishes.

All products covered by these specifications are to be installed in accordance with the latest edition of Armstrong's Installation Specifications by a qualified Armstrong flooring contractor whose bid shall include all the materials and labor required.

from detail drawings



Simple detail drawings of the floor design with the manufacturer's color numbers indicated eliminate the need for a full description of the materials to be used. From the drawings and general specifications, the bidding contractor can quickly see the work involved in the flooring job. Installation methods approved by the manufacturer of the flooring should be specified.

Asphalt Tile is another example of a product's falling into two price groupings—De Luxe or swirl grain, and a lower priced Standard or straight grain, styling. Prices vary *within* these two groups according to color. The "A" or darkest colors are the lowest in cost and grade up in price to the "D" or lightest colors.

Armstrong's Rubber Tile, Cork Tile, Custom Corlon Tile, Linotile, and Excelon Tile vary in product cost, but there is no price differential within the color line. A complete article in a future booklet in this series will cover the price structure of resilient floorings in greater detail.

One of the clearest ways to specify resilient flooring materials is to indicate the manufacturer's name and color number. When this is not possible, or if a floor design cannot be selected in advance, it is important that a clear understanding be given of the amount of each material to be used. For example,

> "Asphalt tile design to be composed of color groups: B—25%, C—50%, D—25%, . . ." or,

> ". . . Linoleum in rooms 110 and 112 to be ⅛" jaspé with 12" borders of ⅛" plain regular colors."

Such a specification will give each flooring contractor a standard basis for figuring his bid.

Variations in Contractor's Installation Costs

The labor involved in laying a particular floor design is another big factor in figuring price. If the architect fails to give a clear idea of the complexity of the design, the contractor may base his bid on fewer installation man hours and underbid the job. In such cases, there is sure to be an expenditure of time and words—if not money—before the misunderstanding is settled.

To prevent such misunderstandings, it is recommended that the architect show detail drawings of at least one of the floor designs when they are too complex for adequate description in the specifications. A typical example of such a drawing is shown above. Simplified specifications of materials, colors, gauges, and sizes shown on, or supplied with, the drawings will also be helpful.

Underlayment Requirements in Remodeling Jobs

On remodeling work it is always advisable to list all necessary repairs in the specifications, such as replacing badly worn boards, sanding floors, filling cracks in concrete, etc. Never use a blanket specification such as, ". . . the old subfloor shall be repaired to provide a suitable base for resilient flooring." Such specifications invariably invite the least expensive method of subfloor preparation, which is seldom in the best interest of the client. From the contractor's point of view, competition leaves him no choice but to bid on the least expensive methods. Tight subfloor preparation specifications put all contractors on an equal bidding basis.

It is not necessary for the architect to specify how the flooring contractor should install the flooring materials. It is far safer and more exact to specify that the materials be "installed in accordance with the manufacturer's latest printed instructions."

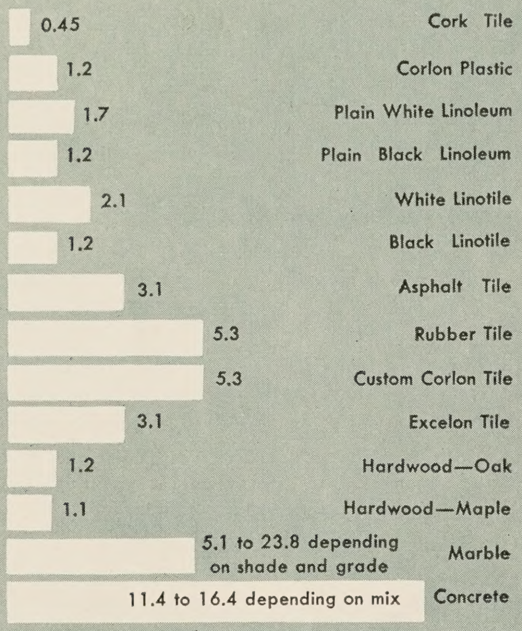
SPECIAL NOTE: Since the Armstrong Line of floors is available to any legitimate flooring contractor, an outright specification for Armstrong materials will produce competitive bidding while also assuring the client of premium quality materials.

Important facts for architects about . . .

the performance of resilient flooring over radiant heating

thermal conductivity

K-90 — BTU/HR./SQ. FT./°F/1″ THICKNESS*



*"K" values do not include lining felt.

Since resilient floorings are generally used in the manufactured thickness only, the conductance is the real value desired for any calculation of heat flow. To obtain the conductance value simply divide the thermal conductivity by the thickness of the material. For example, white Linotile of .125 thickness with a "K-90" factor of 2.1 will conduct 16 BTU's/hour/square foot/degree F.

For exacting calculations, it should be kept in mind that the thermal conductivity of flooring materials will vary somewhat according to type, color, and the method of application of the material to the floor. In any case where the thermal conductivity of a flooring material is of special importance to an installation, contact the Armstrong Cork Company for specific recommendations. However, for radiant heating estimation purposes, it is safe to assume that the temperature difference between the surface of the subfloor and the surface of the resilient floor (except cork tile) will be about 2.5° F. With cork tile floors, the difference is between 9° and 15°.

Increased use of radiant heating in modern homes and buildings has caused many architects to request more information on the performance of resilient flooring materials over heated subfloors.

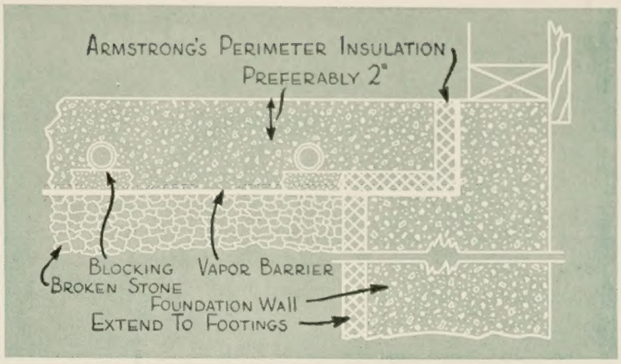
In order to be able to give the architect specific and unbiased recommendations for flooring installations over radiant-heated floors, the Research and Development Center of the Armstrong Cork Company has conducted a series of tests over an eight-year period. Under both experimental and on-the-job conditions, observations have been made of the effects of normal and severe floor temperatures on the hardness, composition, and indentation properties of all Armstrong's Resilient Floors.

The results of these tests show that there is virtually no loss of heating efficiency through the use of resilient flooring materials. With floors of asphalt tile, linoleum, Linotile, Corlon, and rubber tile, temperature difference between the surface of concrete subfloors, commonly used in radiant heating installations, and the resilient flooring surface, is about 2.5 degrees F. With floors of cork tile, which has a thermal conductivity or "k" factor lower than the other resilient flooring materials, the difference is several degrees F. greater. None of these temperature variations, however, is great enough to result in appreciably increased fuel consumption since the time lag required to bring resilient flooring, of the thicknesses commonly used, to the operating temperature of radiant heating systems is insignificant.

No Harmful Effect

The observations of Armstrong's Research and Development Center have also shown that floor heat, within the limits commonly recommended for radiant heating, has no harmful effect on either the resilient flooring or the adhesives used in installation. Both laboratory tests and actual field experience indicate that resilient flooring materials can be chosen for radiant-heated subfloors by exactly the same standards as those where other types of heating are employed. Each type of resilient flooring material is installed over a radiant-heated subfloor with the same adhesives and in the same manner as recommended for conventional floors. It should be noted in this connection that the use of radiant heating does not change the limitation that only certain types of resilient floors may be installed over concrete slabs in direct contact with the ground. (See pp. 8 and 9.)

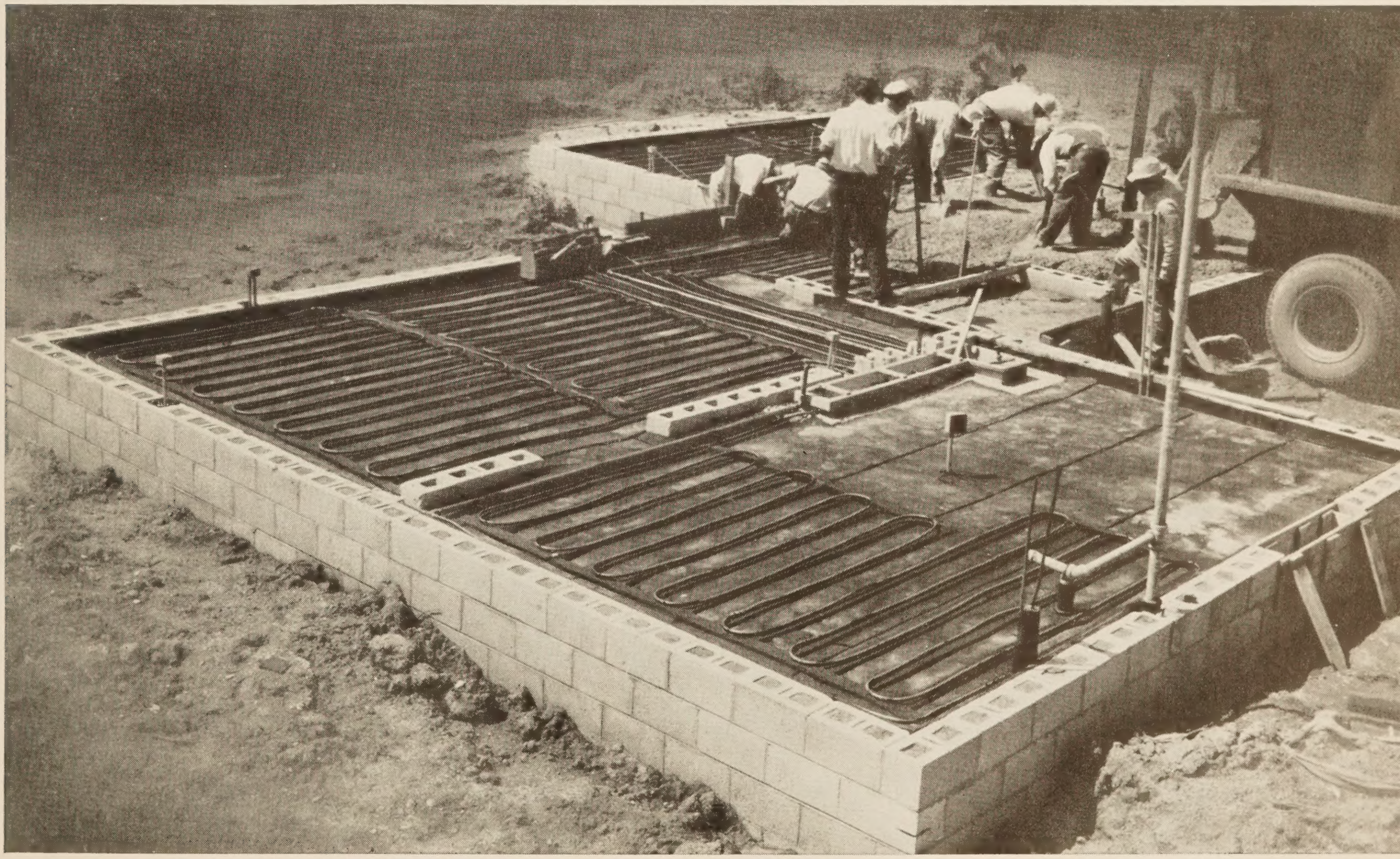
The American Society of Heating and Ventilating Engineers has established 85° F. as the maximum surface temperature for radiant-heated floors. Floor temperatures higher than this standard are considered uncomfortable underfoot. Because of their thermoplastic quality, asphalt tile and plastic asbestos tiles become slightly softer, and indent more easily, when radiant heating temperatures run above normal. The usual measures to protect resilient flooring against indentation, described on Page 15 of this booklet, are adequate to prevent indentation in Armstrong's Asphalt Tile or Excelon Tile when floor temperatures do not exceed this standard 85° F. maximum.



Section through a floor panel using Armstrong's Perimeter Insulation. Note that the insulation extends around the edges of the slab in contact with all the exterior foundation walls.

Certain characteristics of radiant heating systems as recommended by the American Society of Heating and Ventilating Engineers have an important bearing on maintaining comfort during cold weather without requiring floor temperatures exceeding 85°. These are adequate perimeter insulation for the slab, appropriate insulation of the building, and reasonably low infiltration. The pipe grid layout should give adequate coverage without excessively high water temperatures, and the spacing of pipes should be such that there is a minimum of temperature variation between the area directly above the pipes and the area above the space between them. While none of these design features is within the appropriate scope of Armstrong's recommendations to architects, they have all been considered by Armstrong's Research and Development Center in evaluating its test results. When these standards are used as the basis for the design of radiant heating systems, Armstrong's Resilient Floors may be specified with assurance of the same excellent performance they have demonstrated in other applications.

This photograph shows the final construction stage of a radiant heating installation. The method of perimeter insulation described in the figure above is being used. The pipe circuit is closed and tested under pressure before concrete is poured.



Factors that influence the selection of . . .

adhesives for resilient flooring

The life and serviceability of any resilient flooring installation depend greatly upon the proper application of the correct adhesive which will meet its specific installation requirements. Frequently, the selection of the proper adhesive is as important as the selection of the floor itself. To bond properly, the adhesive must hold the flooring material to the subfloor by surface attachment. This surface attachment, or bonding strength, must be great enough to prevent the separation of the flooring material from the subfloor under stresses slightly greater than those encountered in normal use. At the same time, the bond must not be so strong that it will be too difficult to remove the resilient flooring at a later date if necessary.

Factors to Be Considered

The type of subfloor, its condition, and the kind of resilient flooring material to be installed are important factors in the selection of the adhesive. Below-grade subfloors, for example, may require a different type of adhesive than suspended subfloors, and asphalt tile must be installed with a different adhesive than linoleum. The adhesive selected must also bond the resilient floor securely to the subfloor without chemical or physical damage to the flooring material. It should also be easy to handle and apply. It should develop and retain the correct "tack" or gripping power throughout the desired working period. The adhesive must have correct viscosity. If it is too thin, it will penetrate too deeply into the material and the bonding power will break down due to lack of sufficient adhesive at the surface. For this reason, resilient flooring adhesives should never be thinned except as specified by the manufacturer.

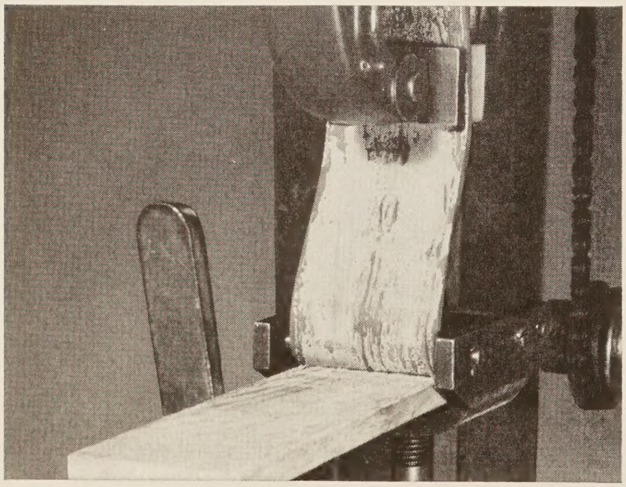
Because the various types of resilient floors available are designed to meet specific flooring requirements, it is necessary that the adhesive used in their installation meet the same requirements. As a guide in the proper selection of adhesives, Armstrong's Research and Development Center has prepared the chart shown on the opposite page as well as a brief description of each adhesive.

Armstrong's No. S-128 Paste is an all-purpose adhesive developed for the installation of linoleum, Linotile, Corlon, rubber tile, cork tile, and the various linoleum and Corlon tiles over suspended subfloors. It has a sulphite liquor base and is water soluble.

Armstrong's No. S-130 Resilient Tile Paste was formulated especially to simplify and speed the installation of Linotile, rubber tile, cork tile, and linoleum and Corlon tiles over suspended subfloors. It develops a quick tack and keeps tiles from sliding or moving while mechanics work over finished areas.

Armstrong's No. S-80 Primer is used to minimize moisture as well as to seal porous and dusty concrete subfloors. It

The bonding strength of any adhesive is determined by its cohesive strength as well as its ability to adhere to surfaces of both materials being bonded. The test strip at left illustrates desired adhesion between the subfloor and the flooring material surfaces and also shows integral cohesion strength.



To insure adhesives of uniform quality, Armstrong's Research Laboratories continually test the bonding strength of adhesives before and after "setting." At right, the "stripping test," one of the many used, measures the bonding strength between the subfloor and the flooring material after setting.

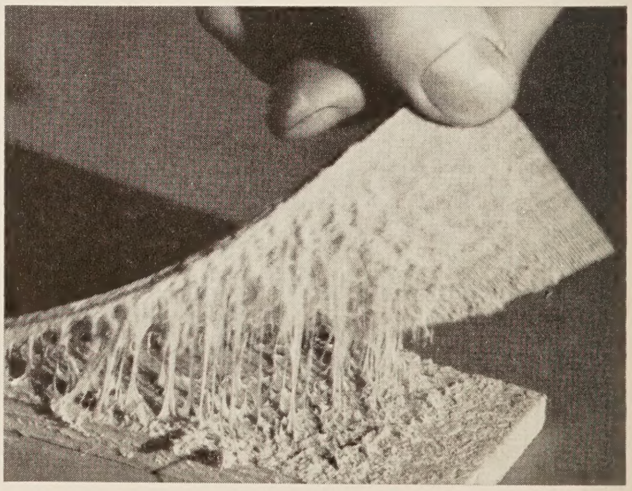


table of recommended adhesives for the installation of Armstrong's resilient floors

Type of Resilient Floor	Wood, Hard-board & Plywood*	Concrete Suspended	Concrete On Grade	Concrete Below Grade	Terrazzo or Marble Suspended	Terrazzo or Marble On Grade	Ceramic Tile Suspended	Steel	Magnesite	Floor Fill
LINOLEUM	S-128	S-128	Don't Install	Don't Install	Rough S-128 Smooth S-214	Don't Install	Rough S-128 Smooth S-214	S-214	Special Recommendation by Armstrong	S-128
LINOTILE	S-130 or S-128	S-130 or S-128	Don't Install	Don't Install	Rough S-130 or S-128 Smooth S-214 or S-104	Don't Install	Rough S-130 or S-128 Smooth S-214 or S-104	S-104 S-214	Special Recommendation by Armstrong	S-130 or S-128
RUBBER TILE	S-130 or S-128	S-130 or S-128	S-104	Don't Install	Rough S-130 or S-128 Smooth S-214 or S-104	S-104	Rough S-130 or S-128 Smooth S-214 or S-104	S-214 S-104	Special Recommendation by Armstrong	S-130 or S-128
CUSTOM CORLON TILE	S-130 or S-128	S-130 or S-128	S-104	Don't Install	Rough S-130 or S-128 Smooth S-214 or S-104	S-104	Rough S-130 or S-128 Smooth S-214 or S-104	S-214 S-104	Special Recommendation by Armstrong	S-130 or S-128
CORK TILE	S-130 or S-128	S-130 or S-128	S-214	Don't Install	Rough S-130 or S-128 Smooth S-214 or S-104	Don't Install	Rough S-130 or S-128 Smooth S-214 or S-104	S-214 S-104	Special Recommendation by Armstrong	S-130 or S-128
CORLON (PLASTIC)	S-130 or S-128	S-130 or S-128	Don't Install	Don't Install	Rough S-130 or S-128 Smooth S-214	Don't Install	Rough S-130 or S-128 Smooth S-214	S-214	Special Recommendation by Armstrong	S-128
LINOLEUM TILE	S-130 or S-128	S-130 or S-128	Don't Install	Don't Install	Rough S-130 or S-128 Smooth S-214	Don't Install	Rough S-130 or S-128 Smooth S-214	S-214	Special Recommendation by Armstrong	S-130 or S-128
ASPHALT TILE	S-80 Primer S-160	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	S-160 or S-90	S-80 S-160 S-190	S-160
EXCELON TILE	S-80 Primer S-160	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	S-160 or S-90	S-80 S-160 S-190	S-160
CONDUCTIVE ASPHALT TILE	S-80 Primer S-160	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	Don't Install	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	S-80 Primer S-160 or S-90	S-160 or S-90	Special Recommendation by Armstrong	S-160

*Over wood, hardboard, and plywood subfloors, lining felt should be installed and the flooring then installed over the felt with the adhesive shown. Asphalt Tile and Excelon Tile may be installed direct to plywood and hardboard subfloors.

also prepares the subfloor for the proper adhesive selected for the installation of asphalt tile. It is a very thin asphalt "cut-back" cement.

Armstrong's No. S-90 Asphalt Cement is recommended for below-grade installation especially if the subfloor shows signs of dampness. It is an asphalt cut-back type cement and is especially alkali and moisture resistant.

Armstrong's No. S-160 Emulsion is an all-purpose adhesive for the installation of asphalt tile and Armstrong's Excelon Tile over suspended, grade-level, and below-grade subfloors. It is a water emulsion of asphalt and is resistant to both alkali and moisture.

Armstrong's No. S-104 Chemical-Set Waterproof Cement is a special-purpose adhesive developed for the installation of Armstrong's Rubber Tile and Custom Corlon Tile over on-grade, concrete subfloors. It is also used to install certain floors to steel, terrazzo, ceramic tile, and other non-porous surfaces, and where excessive surface moisture is unavoidable. This adhesive consists of two elements, one a liquid paste, the other a powder, which are mixed on the job and must be installed within a critical time.

Special Problems

Frequently, unusual conditions such as extra-high alkalinity in concrete or magnesite subfloors will necessitate special adhesive recommendations. In such instances, Armstrong will be glad to furnish additional information which will be of help in determining the proper adhesive.

In order for architects to be sure that the proper adhesive is being used, it is suggested that they specify the adhesive or specify that the flooring contractor use the adhesive recommended by the manufacturer of the resilient flooring being installed.

A more important question than ever . . .

which resilient floor over concrete?

There are at least two reasons why it is now more important than ever for architects to be aware of the problems involved in specifying resilient floors for installation over concrete. First, the use of concrete in direct contact with the ground has vastly increased during the past decade. Second, the resilient flooring industry has developed new types of floors and improved others, especially to provide resistance against the harmful effects of alkaline moisture, so that many more installations are involved. It is important to understand the "moisture problem." As most architects know, alkaline salts are present in concrete under any conditions. Their presence does not, however, affect resilient floors to any serious extent unless moisture is present, as it invariably is when the subfloor is in contact with the ground. On adequately ventilated and dried suspended concrete subfloors, all the same types of resilient floors that are suitable for installation over wood subfloors may unhesitatingly be specified.

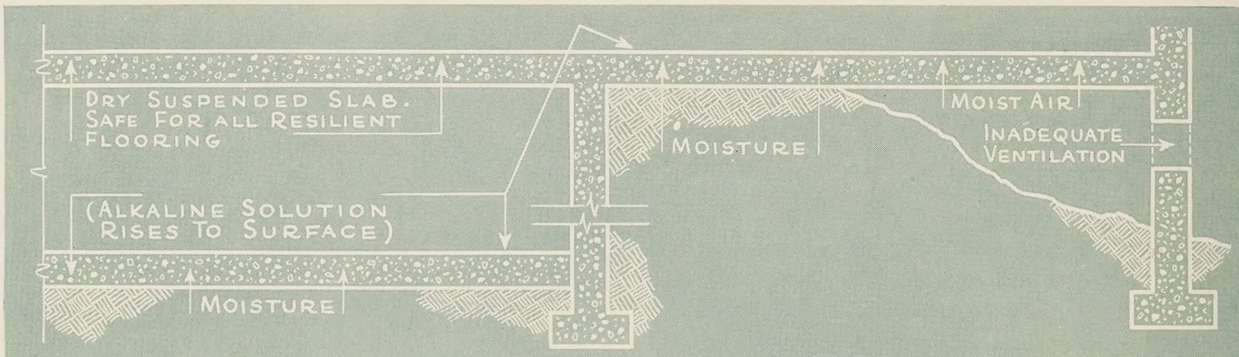
Adequate Drying Time

However, the importance of allowing adequate time to permit suspended concrete subfloors to dry thoroughly cannot be overemphasized. Wherever possible, concrete should be permitted to dry out for several months. Every effort should be made to provide heat and good ventilation. In every case, the subfloor should be tested for moisture before installation of resilient flooring. (See illustration on opposite page.)

Since the degree of moisture present is the main factor determining the seriousness of the alkaline condition, resilient floors which are suitable for installation over concrete in contact with the ground are usually divided into two categories—those which may safely be specified for use on grade or below grade, and those which are suitable for use on grade but not below grade. As is to be expected, the "moisture problem" in basements is more severe than that encountered at grade level.

On Grade or Below Grade. For years, asphalt tile has been the only resilient floor which could safely be specified for basement use, and it remains an excellent low-cost floor for this purpose. A new vinyl-plastic-asbestos tile, Excelon, has now also been developed by Armstrong research for the purpose of providing a resilient floor of superior durability and appearance for basement or on-grade use. Excelon Tile is also greaseproof.

On Grade. Armstrong's Rubber Tile and Custom Corlon Tile may now safely be specified under normal on-grade conditions over concrete by the use of a special adhesive, Armstrong's No. S-104 Chemical-Set Waterproof Cement.


Dry Suspended Slab. Safe For All Resilient Flooring
Moisture
Moist Air
Inadequate Ventilation
(Alkaline Solution Rises To Surface)
Moisture

This drawing shows how moisture from the ground or from an inadequately ventilated air space below penetrates the concrete slab, bringing alkali to the surface in solution. This solution attacks the oil binders of most resilient flooring materials, causing a chemical change. Linoleum and other resilient flooring materials may be used on dry suspended floors, but on below-grade floors which contain ground moisture, asphalt tile or vinyl-plastic-asbestos tile (Excelon) should be installed. In addition to Excelon Tile and asphalt tile, rubber tile, Custom Corlon Tile, and cork tile may be installed over on-grade concrete subfloors. (See "On Grade," above, for special cork tile conditions.)

More than six years of laboratory tests, and trials under actual conditions, have proved that such installations will give satisfactory service for the normal lifetime of the tile. Armstrong's Cork Tile may be installed over a concrete subfloor in contact with the ground with No. S-214 Waterproof Cement if the surface of the slab is at least 12 inches above grade, the ground slopes away from the building, and the slab is well cured and visibly dry.

Wet Floor May Appear Dry

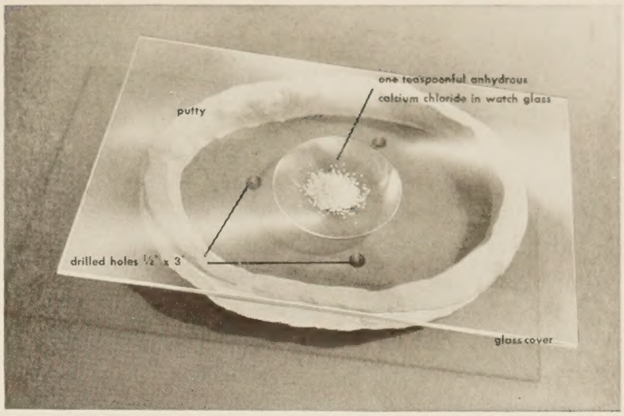
It is never safe to assume that a concrete slab will always be dry because it has appeared dry for several years. Rapid evaporation at the surface will make a concrete floor appear free from moisture but when a resilient flooring is cemented to this surface, evaporation is prevented or slowed down and the alkaline solution collects under the flooring material.

There have been many attempts to find ways to waterproof concrete slabs to make on- and below-grade use of all types of flooring materials possible. To date, the only method which has been proved to work satisfactorily is the membrane method. Specifications for such construction are beyond the appropriate scope of Armstrong recommendations. Even when resilient floorings approved for use without membraning are specified, it is advantageous to include a membrane in slab floors when possible. In any case, it is highly desirable when concrete slabs are in direct contact with the ground, that the slab be placed on a well-drained base.

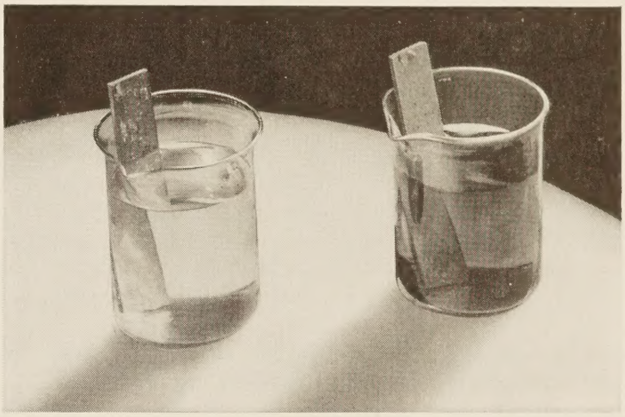
Regional Conditions

While alkali and moisture present difficulties everywhere, there are a few sections of the country where the aggregates used in compounding concrete contain excessive amounts of alkaline salts. As the subsoil moisture seeps through such concrete subfloors, it dissolves the alkaline salts within the concrete, carrying them to the surface. These salts accumulate underneath the tile or are deposited on the edges of the tile as the moisture evaporates. These alkaline deposits build up over a period of time and may gradually force the tiles up from the subfloor or permanently adhere to the surface edges of the tile unless removed promptly. Generally this condition is of a temporary nature and will gradually be eliminated as the continuous passage of moisture dissipates the alkaline salts within the subfloor. An experienced local floor contractor is the best source of useful advice where these special circumstances are encountered.

Another important factor in considering the correct choice of a resilient tile for installation over concrete is the alkali resistance of the pigments used in its manufacture. Armstrong's Laboratories have worked on this problem for years and have developed specifications for alkali-resistant pigments for all the flooring materials recommended for use over concrete in direct contact with the ground. These pigments prevent fading and "color bleeding" of the tile.



This moisture test should always be made on newly poured suspended concrete floors of all types before the installation of materials that are affected by alkaline solutions. If floor is too moist, calcium chloride is partly dissolved in 24 hours.



Immersion for 2 hours in a 2% solution of sodium hydroxide determines color permanency of pigments in tiles specified for use over below-grade concrete. Beaker at right shows bleeding of colors from pigments that are not alkali resistant.

Development of a special adhesive, Armstrong's Chemical-Set Waterproof Cement, permits the installation of Rubber Tile and Custom Corlon Tile over grade-level concrete slabs. A two-part adhesive that sets through chemical action, it is mixed on the job and each area installed within a critical time period.

For remodeling jobs, here's what an architect needs to know about . . .

preparing old subfloors for resilient flooring

With the continuing importance of modernization projects, resilient floors offer the architect the simplest means of utilizing the previous floor construction. However, no resilient floor is better than the subfloor over which it is installed, and satisfactory results depend to a very great degree on correct preparatory work. Such resilient floors as linoleum, Linotile, plastic flooring (such as Corlon), rubber tile, cork tile, vinyl-plastic-asbestos tile (such as Excelon), and asphalt tile are readily adaptable to remodeling jobs and will give many years of service if subfloors are properly prepared.

The installation of resilient floors in an old structure usually involves the conversion of what was once a wearing floor into a subfloor. Two main conditions must be met before such a floor forms a satisfactory base for a resilient finish floor. First, it is necessary to have a relatively smooth-surfaced subfloor, free from serious irregularities which would mar the appearance of the finish floor. Second, since nearly all resilient floorings are applied with adhesives, the old floor must be so prepared as to provide a satisfactory bonding surface for the adhesive.

Wood Floors. The preparation of old wood floors for the installation of resilient flooring depends on the type of construction:

1. Single wood floors, not tongue-and-groove. These should be covered with 25/32″ flooring or ⅝″ or heavier plywood. (For details of both wood and mastic type underlayments see pp. 12 and 13.)
2. Single wood floors, tongue-and-groove. Use hardboard or ⅜″ plywood underlayment.
3. Double wood floors. If boards are 3″ or more, proceed as (2), above. If less than 3″, renail loose boards and replace defective or badly worn boards with new material. Fill cracks and holes with plastic wood or snugly fitting wood pieces. Remove surface irregularities, such as cupping, by sanding.

preparing old wood subfloors

Type of Subfloor		Hardboard	Plywood*
Single wood floor	Tongue-and-Groove	√	⅜″ or heavier
	Not Tongue-and-Groove	Do not use	⅝″ or heavier
Double wood floor	Strips 3″ or more	√	⅜″ or heavier
	Strips less than 3″	Renail or replace loose boards. Remove surface irregularities.	

Floors too uneven to be sanded smooth: S-170 Flormastic, or hardboard, or ⅜″ or heavier plywood.

*See page 13 for recommended types.

Wood floors which are too uneven to be sanded smooth, should be covered either with a mastic-type floor fill made with Armstrong's No. S-170 Flormastic, or with hardboard, or with ⅜″ or heavier plywood.

Old wood floors to which a surface treatment, such as paint or oil, has previously been applied present a special problem. Such treatments tend to prevent the penetration of the adhesive into the wood and deprive it of bonding strength. All traces of oil or paint should be removed by sanding, scraping, or, if necessary, scrubbing with chemical solvents. The subfloor should be dry and free of all traces of solvents before the installation of flooring.

On the other hand, when the pores of any wood floor have been opened by sanding, too much penetration also causes a loss of bonding power. Immediately after sanding, therefore, a sealing compound such as Armstrong's Floor and Wall Size should be applied and allowed to dry before application of the adhesive.

Concrete Floors. The problem of securing proper adhesion to concrete subfloors usually arises from dusty, chalky, or flaky concrete surfaces. This can usually be overcome by thorough sweeping with a wire brush to remove all loose particles, followed by a sealing treatment with Armstrong's Floor and Wall Size. All cracks, minor holes, and crevices should be filled with Armstrong's Crack Filler or a filler of equal quality before any resilient flooring installation is started. If concrete floors are too badly damaged to be repaired by crack fillers, the entire floor may be resurfaced with a fill made from Armstrong's Flormastic or a concrete topping. (See p. 12.) It is important that concrete topping and new concrete floors be fully cured before installing resilient floors.

Special Conditions. The above comments cover the most common conditions encountered in dealing with subfloors of wood and concrete. Other types of subfloors such as metal, terrazzo, and magnesite require special treatment which is so dependent on individual circumstances that it is impracticable to lay down general recommendations. In such cases Armstrong will be glad to give you assistance by telephone or by letter and, when the occasion demands it, will send a representative to study the subfloor condition and offer suggestions on proper methods of preparation.

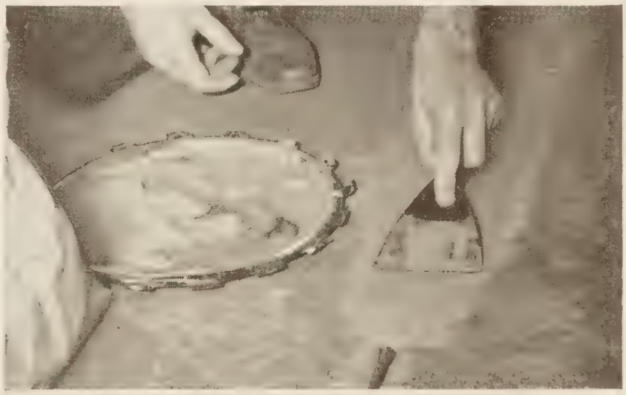
To insure a proper bond for the adhesive, all paint must be removed. Because of the speed with which paint can be removed from large areas, the acetylene paint burner is often preferred for this type of work. However, machine sanding and chemical paint removers also do the job quickly and well.

Since adhesives will not adhere to oil- or grease-soaked floors, it is necessary that these floors be cleaned with a strong grease-cutting solution of tri-sodium phosphate or alkali-type cleaner. Floors should be rinsed well to remove excess chemicals which might destroy the binding qualities of the flooring adhesive.

Surface defects in the old floor often damage or otherwise mar the finished resilient floor. This can be prevented by carefully renailing loose boards and sanding or planing warped areas to floor level. All badly damaged floor boards should be replaced. Sanded areas should be treated with a sealing compound.

An underlayment, consisting of four-by-four-foot sheets of hardboard or plywood, is advised for uneven subfloor areas which cannot readily be corrected by sanding. When laid over a tongue-and-groove floor, this underlayment provides a sound and economical base for all types of resilient flooring.

Another method of resurfacing damaged wood and concrete subfloors is the use of a cold mastic floor fill. It can be laid directly over the old floor. Wood screeds and a straightedge may be used to maintain the thickness necessary for leveling. Cold mastic fills will not adhere to subfloors treated with oil.



Although resilient flooring adhesives will fill minor cracks and crevices in concrete subfloors, it is best that all holes, cracks, and crevices be filled with a reliable cement crack filler before installation is started. It is important that all concrete subfloors be allowed adequate drying time before installing flooring.

Satisfactory resilient flooring installations often depend on . . .

selecting the right type of underlayment

Resilient flooring materials all tend to mold themselves somewhat to irregularities of the surface over which they are installed. This tendency, in addition to the more or less severe seasonal expansion and contraction of subfloors, makes it extremely important that architects and builders be familiar with the right underlayment for the particular conditions and that they insist upon its correct installation. Otherwise, the resilient finish floor may lose some of its attractive appearance or even split.

There are two main types of subfloor to be considered—concrete (or other monolithic floors, such as terrazzo, ceramic tile, or steel) and wood—and two main types of underlayment—board and mastic. If the subfloor is concrete, and an underlayment is needed, a mastic-type compound should be used. Wooden subfloors call for either board or mastic-type underlayments, depending on their type and condition. Mastic-type underlayments are generally used to *level* wood floors, however, not to smooth them.

Mastic-Type Underlayments. Mastic underlayments are of two kinds—those which use a binder such as asphalt or latex in the mix and those which consist simply of a powdered mixture such as cement, gypsum, and sand, to which only water is added. For some installations, either type will be satisfactory, but generally only the binder-type mastics are suitable for the thin applications needed for underlayment work. The powdery floor fills all too often break down under traffic when applied in thin coats. Of the binder-type mastics, the asphalt type has proved very satisfactory over years of use. Latex underlayments of various types have been developed, but their advantages do not yet seem to outweigh their higher cost. At present, Armstrong specifications call for the asphalt type of mastic only, a recommendation based on years of research and familiarity with all types of resilient flooring in use today.

Armstrong's Flormastic, an asphaltic compound, mixed with Lumnite cement and aggregates is both inexpensive and satisfactory under any normal conditions, including installations over radiant-heated subfloors. However, Flormastic should not be used when the resilient flooring is to be installed with No. S-104 Cement.

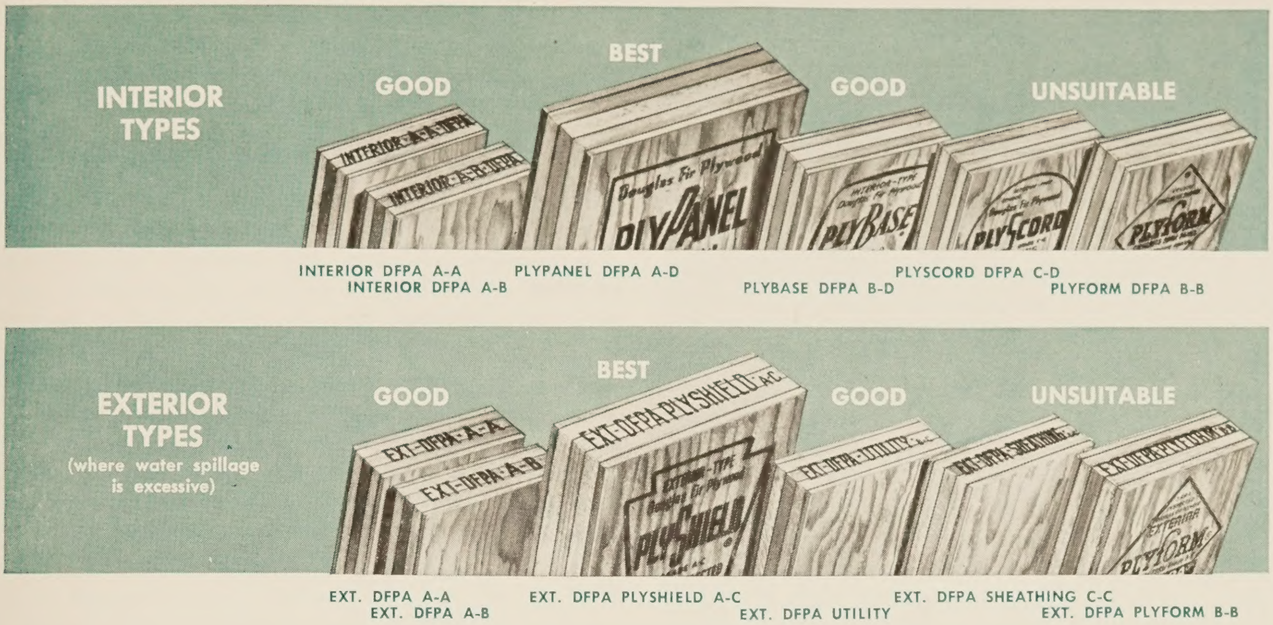
It is important to remember that the subfloor must be free from surface treatments such as paint, oil, and varnish before a mastic-type underlayment is applied.

Board-Type Underlayments. The basic choice here is between hardboard and plywood. Most architects have found it satisfactory to specify hardboard on remodeling work and plywood on new construction. The main reason for this is that the thinner hardboard type of underlayment avoids excessive building up of old subfloors. In new construction, on the other hand, it is often desirable to build up subfloors, and plywood serves this additional purpose well.

Over wood subfloors, galvanized chicken wire or expanded metal lath should be nailed to the floor to reinforce cold mastic floor fill. The wire netting allows the wood floor to expand and contract without cracking or damaging the floor fill.

A cold mastic floor fill made from Armstrong's Flormastic may be troweled to a thin "featheredge" in leveling worn or damaged areas of concrete subfloors. This will frequently eliminate the need for complete resurfacing of an old subfloor.

suitability of plywood (DFPA) underlayments

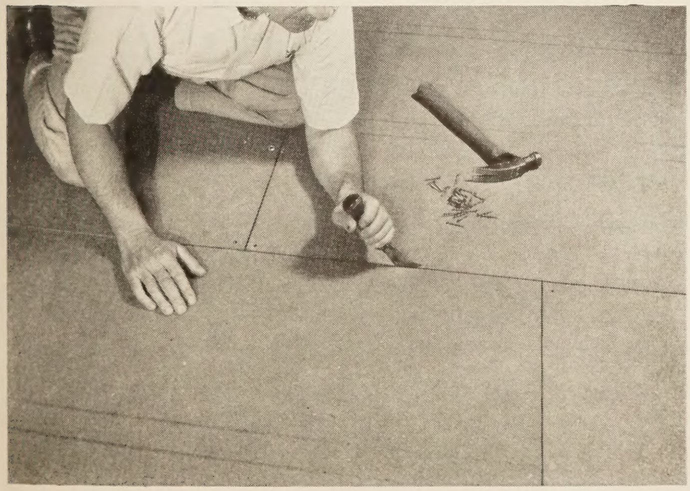


Hardboard. Four different types of hardboard are recommended in Armstrong specifications—Temboard Underlayment, Temboard, Temwood, and Masonite Underlayment. These hardboards have been in use for over 25 years and have proved themselves satisfactory. Tempered hardboards should never be specified as underlayments, because they tend to buckle when subjected to moisture, are difficult to nail, and more expensive.

Plywood. This material has been used satisfactorily as an underlayment for many years. The general term "plywood," however, should always be qualified in underlayment specifications. Only eight of the twelve types of plywood available are suitable as underlayment. Among interior plywoods, grades such as AD, AB, AA, and BD are recommended, with AD preferred. Grades CD and BB should not be used.

Among exterior plywoods, grades AA, AB, AC, and BC are recommended, with AC preferred for both cost and performance. CC and BB should not be used. A 3/8″ or greater thickness should be used in all cases. (See chart.) As a general rule, interior plywoods are used because of lower cost, although exterior plywoods are recommended wherever excessive water spillage occurs, such as around soda fountains, at the entrances of public buildings, and on counter tops.

Joint spacing of approximately 1/16″ is left between sheets of hardboard underlayment to allow for slight expansion and contraction with varying moisture conditions. The hardboard sheets should be laid with joints staggered, ashlar fashion.



Hardboard or plywood underlayment should be firmly nailed to the underfloor with coated or screw type nails. Nails must be placed not over six inches on center in all directions and at all edges and driven flush with the underlayment.

In specifying resilient floors, for satisfactory service . . .

maintenance problems must be considered

Often, the maintenance of resilient floors is considered to be outside the architect's province. There are, however, two very important reasons why familiarity with maintenance problems may materially affect your choice of resilient floors. First, architects are rarely consulted by owners on proper maintenance—and the owner goes ahead with his own methods. If these damage the appearance or shorten the life of the floor, the architect may be thought guilty of improper selection of flooring materials. Secondly, it is important to consider the amount of wear to which the floor area in question will be subjected. Excessive, uneconomical maintenance may result if an unsuitable resilient floor is installed. In his own interest, the architect should therefore be familiar with the amount of maintenance required by each type of floor before specifying one for a particular location.

Apart from their handsome looks, one of the main reasons for the great popularity of resilient floors for both residential and commercial floor installations is their ease of cleaning. They never need costly refinishing. Occasional washing and waxing, along with regular sweeping, are all the maintenance they normally require. However, resilient floors vary in the amount of care they need, and it follows that floors among the easiest to maintain should be specified for areas, such as entrance ways, where frequent cleaning cannot be avoided.

Since the maintenance characteristics of the different types of resilient floors overlap, and ease of maintenance is also affected by the color and pattern of the flooring selected, the following ranking is intended as an approximate guide to the amount of maintenance normally required by the various Armstrong Floors.

best Linotile
Excelon Tile
Custom Corlon Tile

Linotile is considered the easiest to maintain of all the Armstrong Floors. Its exceptionally dense, tough composition makes it an excellent choice for heavy-traffic areas. Washing and waxing are usually required infrequently. Both Excelon Tile and Custom Corlon Tile are vinyl plastic floors with exceptional advantages from the standpoint of maintenance. Both provide unusual resistance to the harsh cleaners which are all too often used in spite of manufacturers' warnings. In order to retain the appearance that a lustrous finish gives them, and to provide the added protection that waxing affords, Armstrong has always encouraged and specified occasional applications of a high-quality wax, after washing, as a necessary part of the proper care of plastic floors of all kinds.

excellent Corlon
Linoleum

Linoleum perhaps best typifies the years of popularity which resilient flooring materials have enjoyed for their ease and economy of maintenance. Regular sweeping and occasional washing and waxing are all that are required to keep linoleum in good condition. Armstrong's Corlon, a sheet-type plastic flooring, offers the additional advantage of excellent resistance to common household reagents.

good Rubber Tile
Asphalt Tile

The smooth plate finish of rubber tile requires slightly more frequent maintenance than the floors described above if it is desired to retain the high gloss which adds so much to its beauty. Rubber tile also benefits from occasional buffing with No. 00 steel wool. This keeps the rubber in prime condition and helps preserve the finish. For its low cost, asphalt tile provides a floor that is remarkably economical to maintain. Careful cleaning and periodic waxing, especially in the first months after installation, will help assure easy maintenance.

fair Cork Tile

Cork tile is not ordinarily specified for heavy traffic areas and should not be installed where it will be subjected directly to tracked-in dirt. In areas of less severe traffic, cork tile is readily maintained by daily sweeping and occasional washing and waxing. In cases of excessive soiling, machine scrubbing or sanding and refinishing may be necessary.

The following recommendations for resilient floor care have been outlined by the Armstrong Research and Development Center. They are the result of continuing research over a period of many years on all types of resilient floors. In essence, they show that simplicity is the best technique.

Sweeping. Dirt tends to slip off easily from the smooth, lustrous surface of any resilient floor. Daily sweeping with a soft broom or dry mop will keep this type of flooring clean for long periods. Oil mops or oil-type sweeping compounds are not recommended.

Washing. "More floors are washed away than worn away," says an old adage in the flooring industry. Unless they are subjected to unusual amounts of dirt, resilient floors should be washed infrequently. For all types, Arm-

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strong's All-Purpose Liquid Cleaner is recommended. This preparation is manufactured especially for resilient floors. New resilient floors should not be washed until the adhesive is thoroughly set—a period of at least four or five days for all resilient floors.

Waxing. As soon as a resilient floor has been allowed to dry after washing, it should be waxed. Most people have a tendency to use too much wax—a practice as expensive as it is inefficient. A thick film of wax forms a crust on top, leaving a soft, gummy mass underneath. Dirt penetrates the crust and lodges in the soft wax, making the floor appear gray and dirty. It is much better to apply two thin coats than one thick coat.

Paste waxes, which may contain oil, grease, or solvents such as naphtha or turpentine, should never be used except for cork tile. The ideal wax for all resilient floors is a water-emulsion type such as Armstrong's Linogloss Wax, which dries in less than 20 minutes to a hard, colorless finish that is lustrous but not shiny. Linogloss Wax is made especially for resilient floors.

Stain Removal. The adjoining chart shows suggested methods of removing stains from all types of Armstrong Resilient Floors. It does not cover all types of blemishes, and the methods outlined may not remove all stains. However, they have proved to be the best and safest way to remove the most frequently encountered stains. Armstrong will always be happy to advise on any particular stain removal problem for which these methods do not prove fully effective.

Protection. An element in the care of resilient floors which is often overlooked, but adds greatly to their life and beauty, is the use of furniture rests. The function of a furniture rest is simply to extend the area over which the weight of furniture loads is distributed, and thus prevent indentation. The following table shows the recommended types of rests for various furniture weights.

type of stain	type of floor			
	Linoleum Linotile Corlon	Asphalt Tile Excelon Tile	Rubber Tile Custom Corlon	Cork Tile
Alcohol	2	1	2	2
Acids Alkalis Burns Drain Cleaners Ink Iodine Lye Mercurochrome Metal Nail Polish	3	3	3	3
Chewing Gum Paint Varnish Tar	4	4	4	4
Dry Cleaners Fruit Juices Grease Shoe Polish	1	3	3	1
Rubber Heel Marks	3 or 5	3	3	3 or 5

methods of removal

1. Wash with Armstrong's Liquid Cleaner, rinse, wax.
2. Rub with No. 0 dry steel wool, rinse, and wax.
3. Rub with No. 0 steel wool dipped in Armstrong's Liquid Cleaner, rinse, and wax.
4. Remove with putty knife, rub with No. 0 steel wool dipped in Armstrong's Liquid Cleaner, rinse, and wax.
5. Rub lightly with cloth dipped in paste wax. Buff.

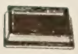
recommendations for the selection of Armstrong's Furniture Rests

Weight of fully loaded furniture	size of rest or cup required (specify by number)				
	Corlon and Linoleum	Linotile	Excelon, Asphalt Tile	Custom Corlon, Rubber Tile	Cork Tile
Up to 50 Lbs. per leg	NT-10 CT-100 CFT-300 CFT-301	NT-10 CT-100 CFT-300 CFT-301	NT-20 CT-200 CFT-400 CFT-401	NT-10 CT-100 CFT-300 CFT-301	NT-20 CT-200 CFT-400 CFT-401
50-100 Lbs. per leg	NT-20 CT-200 NDC-6 CFT-400 CFT-401	NT-10 CT-100 NDC-6 CFT-300 CFT-301	NT-50 CT-500 NDC-7	NT-10 CT-100 NDC-6 CFT-300 CFT-301	NT-35 CT-350 NDC-6
100-150 Lbs. per leg	NT-20 CT-200 NDC-6 CFT-400 CFT-401	NT-10 CT-100 NDC-6 CFT-300 CFT-301	NDC-225	NT-10 CT-100 NDC-6 CFT-300 CFT-301	NT-50 CT-500 NDC-7
150-200 Lbs. per leg	NT-35 CT-350 NDC-6	NT-10 CT-100 NDC-6 CFT-300 CFT-301	NDC-325	NT-10 CT-100 NDC-6 CFT-300 CFT-301	NT-50 CT-500 NDC-225
200-250 Lbs. per leg	NT-35 CT-350 NDC-6	NT-20 CT-200 NDC-6 CFT-400 CFT-401	NDC-325	NT-20 CT-200 NDC-6 CFT-400 CFT-401	NDC-225
250-300 Lbs. per leg	NT-50 CT-500 NDC-7 NDC-125	NT-20 CT-200 NDC-7 NDC-125 CFT-400 CFT-401	NDC-325	NT-20 CT-200 NDC-7 NDC-125 CFT-400 CFT-401	NDC-325

CFT
Chrome
Furniture
Type

NT
Nail
Type

CT
Cotter
Type


NDC
Cup
Type

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